

Areawide IPM for Commercial Wheat Storage

Paul Flinn¹, David Hagstrum¹, Carl Reed², and Thomas Phillips³

¹USDA,ARS, Grain Marketing and Production Research Center, Manhattan KS

²Dept. Of Grain Science & Industry, Kansas State Univ. Manhattan, KS

³Dept. Of Entomology & Plant Pathology, Oklahoma State Univ., Stillwater, OK

Introduction

Insect pest management in grain elevators can be done more effectively and at a lower cost when insects are managed throughout a network of elevators. Areawide IPM is particularly important for stored wheat because insects are moved through the marketing system along with the grain. If insects are not controlled at one location, they can be spread to many other locations, which increases the cost of pest management. A sampling-based program was developed for managing insect pests in upright-concrete grain elevators.



Stored-Grain Ecosystem



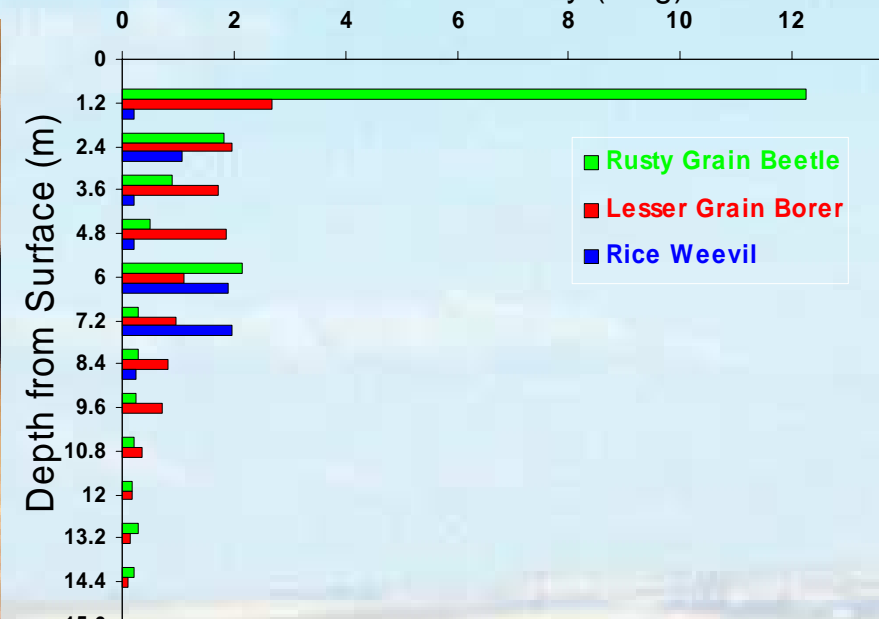
Lesser Grain Borer: larvae develop inside the grain kernels



Insect-damaged kernels can cause a major loss in value.



These small parasitic wasps *Theocolax elegans* (Pteromalidae), attack beetle larvae developing inside the grain kernel.



Highest insect density was at the grain surface. Sampling to a depth of 40 feet found most insect problems.

Sampling Stored Grain

We compared many different grain-sampling devices. We found that the vacuum probe sampler was the best way to sample stored grain without having to turn it.

We used the vacuum probe to take 10, 1-gal grain samples in the top 40 feet of each silo. An inclined sieve was used to find insects in the samples. The insects were identified and counted, and the data was entered into the decision support software, Stored Grain Advisor (SGA) Pro.



Vacuum probe sampling proved to be the best way to sample grain for insects. 4ft tubes are screwed together and pushed down into the grain.

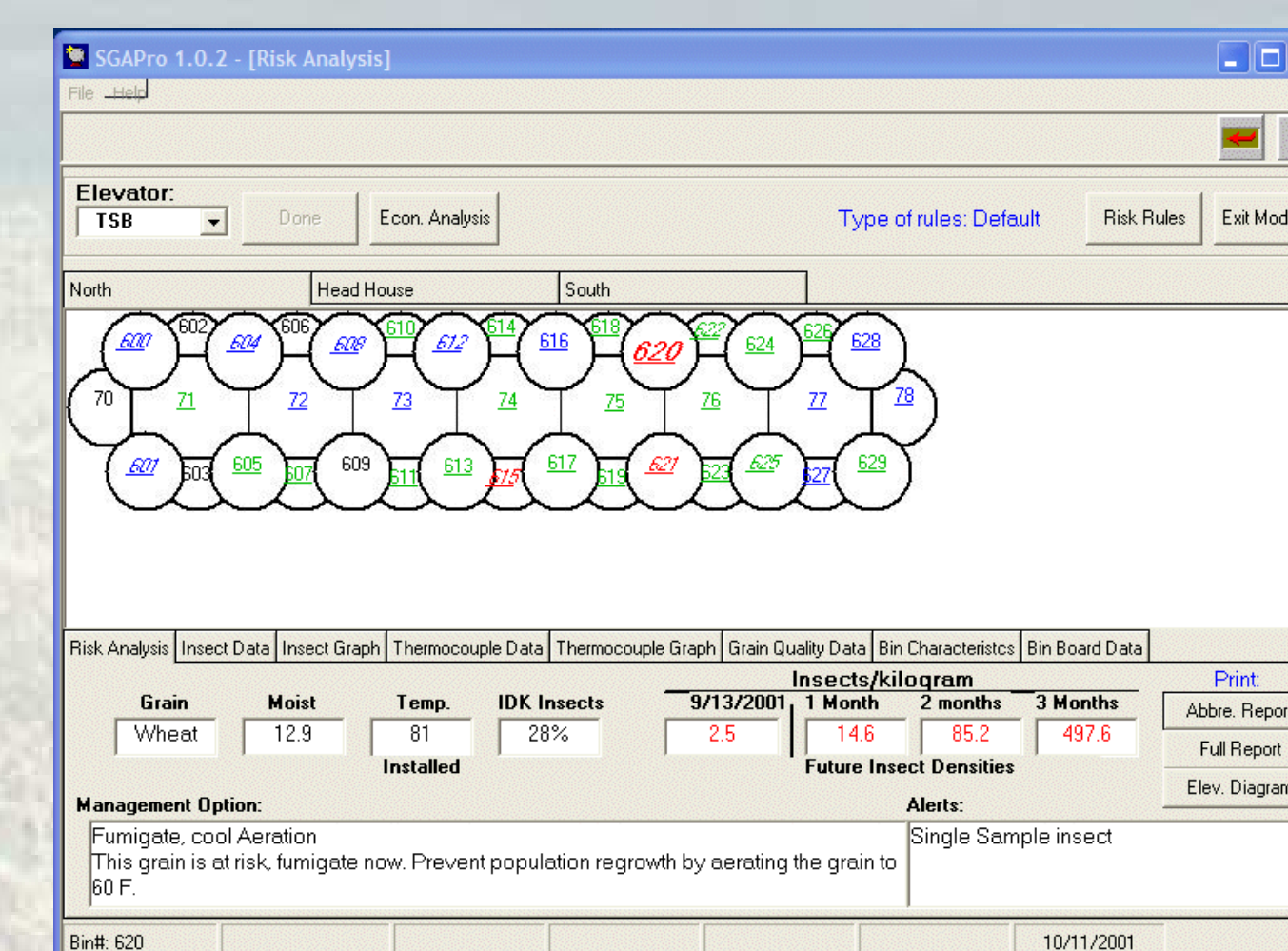


Grain technician using an inclined sieve to separate insects from grain samples. Grain flows over the screen and into the pail, insects are collected in a pan below the screen.

SGA Pro Validation

SGA Pro analyzes the insect data, grain temperatures and moistures, and determines which bins need to be fumigated. The risk-analysis program also uses a predictive model based on the grain temperature and moisture for each bin to predict future insect numbers.

Currently, most elevators use calendar-based fumigations: the grain is fumigated once in the fall and once again before it is shipped. This method works well sometimes, but often insects in some bins reach economically damaging numbers before they are fumigated; or, bins are unnecessarily fumigated when insect density is very low.



SGA Pro: bins in red, blue or green are at high, moderate, or low risk. Bin 620 is selected, recommendations and predicted insect growth is shown.

Economic Analysis: Default Parameters					
Economic Analysis is only valid for concrete bins with wheat!					
Parameters					
Fumigate Type	Protein/Risk	Risks/Cost	\$/Case (Fumigated/Pound)	Pounds/1000 lbs	\$/Bbl (Fumigated)
Protein	1000	25	\$220.00	500	\$0.07
\$/Bbl (Fumigated)	\$2.75	Shrink Factor	Wages		
	0.185	5	\$15.00		
Results					
Fumigating All Sampled Bins			Fumigating Bins At Risk		
Bins - Bushels:	76	5	125461		
Fumigation	771	Hours	63		
Fumigant	\$5,088		\$417		
Shrink	\$1,119		\$56		
Sampling	\$14,241		\$148		
			\$2,871		
Total Cost:		\$12,448		\$1,892	

Output from SGA Pro economic analysis: the program shows the cost of fumigating all bins at an actual elevator, compared to sampling and fumigating only the bins that need to be fumigated (savings of \$8,556).

Program Accomplishments

- ◆ A new method was developed that allows insect sampling in +100-foot-tall bins without having to turn the grain.
- ◆ We developed and validated a decision support tool that can be used by elevator managers for insect problems in stored grain.
- ◆ Based on data from the last two years, SGA Pro successfully predicted bins at risk (insects) in 527 out of 530 total sampled bins.
- ◆ SGA Pro can save managers money by only fumigating bins at high risk for insect losses, rather than all bins at the elevator.
- ◆ The decision support system reduces the frequency of fumigation by only treating the bins that have high insect density, rather than treating all the bins.
- ◆ Elevators that followed our recommendations after sampling, reduced the number of bins they normally fumigated by at least 50%.
- ◆ A new grain-scouting company was recently started in Kansas that is using SGA Pro and the sampling tools that were developed in this project.

Acknowledgements

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